CLAIMS

1. *In vivo* tomography system with high axial and lateral resolution of the human retina, comprising:

- a Michelson interferometer, producing a full-field tomography setup by interference at coherence length (OCT) with a Z scanning,
- an input light source (S) arranged in an input arm of the interferometer,
- adaptive optical means, designed to correct wavefronts originating from the eye and directed to the eye, comprising a reference source (SLD), a deformable mirror (MD) and means of analysing the wave surface (SH),
- means of detection (CCD), arranged in an imaging arm of the interferometer, designed to produce an image from an interferometric measurement according to the OCT principle, and
- means of adjusting (LA2, LA3, LA4) the focussing of the means of analysis of the wave surface (SH),

characterized in that the means of adjusting the focussing are arranged to force the deformable mirror to adopt an additional curvature, so as to conjugate the input light source (S) and the means of detection (CCD) with a point at a predetermined depth in the retina, said means of adjustment being controlled in synchronism with the Z scanning of the OCT tomography setup.

2. System according to claim 1, characterized in that the adaptive optical means (MD, SLD, SH) are arranged between the Michelson interferometer and the eye to be examined (OEX).

3. System according to one of claims 1 or 2, characterized in that it also comprises means for controlling the adaptive optical means (MD) based on wavefront measurements made downstream of said adaptive optical means on a point image of the reference source (SLD) produced on the retina of the eye.

4. System according to claim 3, characterized in that it also comprises means to introduce an additional light beam, independent of the measurement beam, focussed on the retina.

5. System according to one of the preceding claims, characterized in that the means of analysing the wave surface (SH) comprise an analyser of the Shack-Hartmann type.

6. System according to one of the preceding claims, characterized in that it also comprises means (CBC) to compensate for the effects of birefringence of the cornea, which are arranged in front of the eye (OEX).

7. System according to any one of the preceding claims, characterized in that rectilinearly polarized light passes through the two arms of the interferometer.

8. System according to claim 7, characterized in that it also comprises a polarizing cube (CPR) in order to obtain two mutually perpendicular polarizations in each arm.

9. System according to claim 8, characterized in that the two arms of the interferometer comprise means to switch the polarization by 90 degrees between the outward and return legs.

10. System according to claim 9, characterized in that the means of switching the polarization comprise a quarter-wave plate (QOR, QOM).

11. System according to one of claims 7 to 10, characterized in that the interferometer is illuminated with linearly polarized light (S, P).

12. System according to one of claims 7 to 11, characterized in that it also comprises means of adjusting the orientation of the input rectilinear polarization (P), so as to obtain a predetermined division of the fluxes injected into the two arms of the interferometer.

13. System according to claims 6 and 10, characterized in that the quarter-wave plate (QOM) is placed closest to the eye, before the birefringence compensation means.

14. System according to one of the preceding claims, characterized in that it also comprises means of filtering the corneal reflection.

15. System according to claim 14, characterized in that the means of filtering the corneal reflection comprise a field diaphragm (DCM) arranged to diaphragm the essential component of the flux reflected by the cornea.

16. System according to one of the preceding claims, characterized in that it also comprises means of tuning the adjustment to a given depth, through reaction of the adaptive optical means (MD) to an overall defocussing of the assembly constituted by the reference source (SLD) and the analyser means (SH).

17. System according to one of the preceding claims, characterized in that it also comprises an active target pattern (MAM).

18. System according to any one of the preceding claims, characterized in that it also comprises means of freezing the shape of the adaptive optical means (MD) for the duration of an exposure.

19. System according to one of the preceding claims, characterized in that the reference source (SLD) is arranged upstream of the adaptive optical means (MD).

20. System according to one of claims 1 to 18, characterized in that the reference source (SLD) is inserted into the optical path between the adaptive optical means (MD) and the eye to be examined (OEX).

21. System according to one of the preceding claims, characterized in that it comprises means (IRIS) for tracking the movement of the eye to be examined with the means of adjustment or detection.

22. System according to one of the preceding claims, characterized in that it comprises, in the measurement arm, means of compensating for the effects of the focal chromatism of the eye.

23. System according to any one of the preceding claims, characterized in that it comprises, in the reference arm, means of compensating for the dispersion of the path differences.

24. *In vivo* tomography method with high axial and lateral resolution of the human retina, comprising:

- a full-field tomography by interference with low coherence length (OCT) with a Z scanning, using an input light source (S),
- a production of an image of the retina by means of detection (CCD), from an interferometric measurement according to the OCT principle,
- a correction of the wavefronts originating from the eye and reaching the eye, by adaptive optical means (MD, SLD, SH), arranged between the interferometer and the eye, comprising an analysis of the wave surface on the retina, and
- an adjustment of the focussing of the wave surface analysis,

characterized in that the focussing adjustment is carried out so as to conjugate the input light source (S) and the means of detection (CCD) with a point of predetermined depth in the retina, in synchronism with the Z scanning of the OCT tomography.

25. Method according to claim 24, characterized in that the interferometric measurement comprises a measurement of the contrast of the fringes without modulation by the method termed Wollaston.

26. Method according to one of claims 24 or 25, characterized in that it also comprises a compensation for the effects of birefringence of the cornea.

27. Method according to claim 26, characterized in that it also comprises a linear polarization (CPA) of the reference source (SLD) and a switching of the polarization between the outward and return paths in the arms.

28. Method according to one of claims 24 to 27, characterized in that it also comprises a filtering (DCM) of the corneal reflection.

29. Method according to one of claims 24 to 28, characterized in that it also comprises a tuning the adjustment to a given depth, by controlling the adaptive optical means (MD) in reaction to an overall defocussing of the assembly constituted by the reference source (SLD) and the wave surface analyser means (SH).

30. Method according to one of claims 24 to 29, characterized in that it also comprises an adjustment of the focussing of the wave surface analyser means (SH).

31. Method according to one of claims 24 to 30, characterized in that it also comprises a freezing of the shape of the adaptive optical means (MD) for the duration of an exposure.

32. Method according to one of claims 24 to 31, characterized in that it comprises, in the measurement arm, a compensation for the effects of the focal chromatism of the eye.

33. Method according to one of claims 24 to 32, characterized in that it comprises, in the reference arm, a compensation for the dispersion of the path differences.

34. Method according to one of claims 24 to 33, characterized in that it comprises a command to the wavefront analyser (SH) obliging it to work in defocussed mode.